SACRED HEART COLLEGE (AUTONOMOUS)

DEPARTMENT OF CHEMISTRY

BSC CHEMISTRY

COURSE PLAN

ACADEMIC YEAR 2014 – 15

SEMESTER 5

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*5*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	*Chemistry of d and f block elements*			
COURSE TEACHERS	**:**	*Dr. Joseph John (JJ), Mr. Midhun Dominic C D (MD), Ms. June Cyriac (JUC)*			
Objectives	**:**	➢ To understand the general characteristics of the d and f block elements ➢ To study the physical and chemical properties of d and f block elements ➢ To study the Werner's theory of coordination compounds ➢ To study isomerism in metal complexes ➢ To study the bonding in coordination compounds ➢ To understand the applications of coordination compounds ➢ To understand the classification, properties and applications of organometallic compounds ➢ To study the methods of preparation, properties, structure and bonding of metal carbonyls and metal clusters ➢ To understand the role of metals in biological systems.			
Instructional Hours	**:**	*3 hours per week*			

JJ	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 2 : Co-ordination Chemistry (18 hours)	1	IUPAC nomenclature, coordination number, geometry of complexes with coordination numbers 4 and 6.		
	2	Stability of complexes - factors affecting the stability of metal complexes. Chelates, chelate effect, stepwise stability constant and overall stability constant.		
	3	Isomerism in coordination compounds – structural isomerism and stereo isomerism,	Assignment No: 1	
	4	Stereochemistry of complexes with 4 and 6 coordination numbers.		
	5	Bonding theories –Werner's theory of coordination, EAN	Group Discussion	
	6	Valence bond theory, geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, high spin and low spin complexes, inner orbital and outer orbital complexes.		
	7	Crystal filed theory, splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes	MOODLE- Assignment No:2	
	8	low spin and high spin complexes, strong and weak field ligands, pairing energy		
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 2 : Co-ordinati	10	Analysis of First internal examination	Assignment No.3	
	11	Jahn-Teller distortion, Jahn-Teller distortion in Cu (II) complexes		

	12	MO theory, evidence for metal ligand covalency, MO diagram of complexes of octahedral symmetry (sigma bonding only).		
	13	Spectral and magnetic properties of metal complexes-Electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$ ion.		
	14	Types of magnetic behavior, spin-only formula, calculation of magnetic moments.		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 2 : Co-ordination Chemistry	15	Reactivity of metal complexes-Labile and inert complexes		
	16	ligand substitution reactions $-S_N1$and,S_N2	Demonstration	
	17	Substitution reactions of square planar complexes – Trans effect and applications of trans effect.	PowerPoint presentation	
	18	Revision		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			

MD	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 4 : Metal Carbonyls and Metal Clusters (9 hours)	1	Introduction to metal carbonyls and metal clusters		
	2	Preparation and properties of mononuclear carbonyls.		
	3	Structures of $Mo(CO)_6$, $Fe(CO)_5$ and $Ni(CO)_4$.	Assignment No: 1	
	4	Polynuclear carbonyls, bridged carbonyls and bonding in carbonyls.		
	5	Metal clusters - carbonyl and halide clusters	Group Discussion	
	6	Low nuclearity carbonyl clusters and high nuclearity carbonyl clusters,		
	7	Electron counting schemes for $Rh_6(CO)_{16}$ and $[Os_6(CO)_{18}]^{2-}$	MOODLE- Assignment No:2	
	8	Metal only clusters (Zintl ions). Quadruple bond – structure of $Re_2CI_8^{2-}$.		
	9	**Revision**		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi (Chapter 31 and 32) ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006(Chapter 15) ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 5th edn., John Wiley, New York (Chapter 22 and 23)			
UNIT 5 : Bioinorgan	10	Essential and trace elements in biological systems, Myoglobin and Hemoglobin, role of myoglobin and hemoglobin in biological systems	Assignment No.3	
	11	Mechanism of oxygen transport, cooperativity, Bohr effect, Structure of Vitamin B12		

	12	Cytochromes- Structure and function.		
	13	Metalloenzymes: Inhibition and poisoning of enzymes. A brief study of the following metalloenzymes and their functions. Metallo enzymes of Zn		
	14	Electron Carriers		
	15	Role of alkali and alkaline earth metals in biological systems, Na/K pump.		
		SECOND INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 5 : Bioinorganic Chemistry	16	Biological function and toxicity of metals – Fe, Cu, Zn, Cr, Mn		
	17	Biological function and toxicity of metals – Ni, Co, Cd, Hg and Pb		
	18	Treatment of metal toxicity. Chelation therapy. Anti-cancer drugs – cisplatin and carboplatin	Demonstration	
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, New Delhi, 2010. ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry, 3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry,5th Ed. Pearson 2009. ❖ F.A.Cotton, G.Wilkinson, P. L. Gaus, Basic Inorganic Chemistry,3rd Edn,John –Wiley,1995 ❖ B. Douglas, D. Mc Daniel, J. Alexander, Concepts and models of Inorganic Chemistry 3rd edn., John Wiley. ❖ Ivano Bertini, Harry B Gray, Stephen J. Lippard, Joan Selvertone Valentine,Bioinorganic Chemistry.Viva Books Pvt Ltd. 2007.			

JUC	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
UNIT 1 : Chemistry of d and f block elements (9 hours)	1	**Module 1 : Chemistry of d and f Block Elements** Different properties of d block elements		
	2	electronic configuration, oxidation state.		
	3	Valency, metallic character, colour.	Assignment No: 1	
	4	Magnetic properties, catalytic properties and ability to form complexes.		
	5	Comparison with second and third transition series.	Group Discussion	
	6	Chemistry of Lanthanides		
	7	Their properties	MOODLE- Assignment No:2	
		FIRST INTERNAL EXAMINATION		
Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 1 : Chemistry of d and f block	8	Discussion on CIA	Assignment No.3	
	9	Lanthanide contraction, separation of lanthanides. Actinides, properties. Comparison of lanthanides and actinides		
		SECOND INTERNAL EXAMINATION		

Text Books	❖ J. D. Lee, Concise Inorganic Chemistry 5th edn., Wiley India Pvt. Ltd.2008. ❖ R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D.A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education, 2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 6th edn., John Wiley, New York 1991.			
UNIT 3 : Organometallic Compounds (9 hours)	10	Definition, Classification of organometallic compounds,		
	11	Ylides, Classification on the basis of hapticity,		
	12	Naming of organometallic compounds.	Demonstration	
	13	catalytic properties, alkene hydrogenation, shift reaction,	PowerPoint presentation	
	14	Zeigler-Natta polymerization, 18 e rule,		
	15	Metal-alkene complexes, metal-alkyne complexes,		
	16	Metallocenes-Ferrocene. Zeise salt.		
	17	Preparation and structure.		
	18	Revision		
Text Books	❖ B. R. Puri, L. R. Sharma, K. C. Kalia, Principles of Inorganic Chemistry,31st Edn. Milestone Publishers, New Delhi 2010 ❖ G. L. Meissler, D. A Tarr, Inorganic Chemistry,3rd Edn. Pearson Education,2004. ❖ J. E. Huheey, E. A. Keiter, R. L. Keiter, O K Medhi, Inorganic Chemistry, Pearson 2006 ❖ R. C. Mehrothra and A. Singh, Organometallic chemistry, New age publishers. ❖ F. A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry 3rd edn., John Wiley, New York.1995. ❖ A. G. Sharpe, Inorganic Chemistry, 3rd Edn. Pearson.			

COURSE PLAN					
ACADEMIC YEAR 2014-15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*54*
SEMESTER	**:**	*5*	**CREDITS**	**:**	*3*
SUBJECT TITLE	**:**	**BASIC ORGANIC CHEMISTRY II**			
COURSE TEACHERS	**:**	*Dr. V.S . Sebastian, Dr. Joseph T Moolayil, Dr.Franklin John, Dr. M. George*			
Objectives	**:**	➢ To learn the chemistry of nitro compounds, amines, dyes, organic polymers, soaps, detergents and organic reagents. ➢ To understand and study mechanism of reactions of nitro compounds and amines ➢ To have an elementary idea of chemotherapy, organic spectroscopy and photochemistry ➢ *Ability to explore and reflect about the wide range of possibilities and applications of nuclear reactions and radio activity.* ➢ To identify organic compound using UV, IR and PMR spectroscopic techniques			

	No. of Session	Session Topic and Discussion Theme	Value additions	Remarks
C* Organic compounds containing Nitrogen *(10 hours)	1	Introduction Nitro compounds- nitromethane- tautomerism reduction products of nitrobenzene in acidic, neutral and alkaline media-		
	2	reduction products of nitrobenzene in acidic, neutral		
	3	reduction products of nitrobenzene in alkaline media-	Assignment No: 1	
	4	Electrolytic reduction and selective reduction of poly nitro compounds- formation of charge transfer complexes		
	5	Amines- isomerism- stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines -		
	6	Structural features affecting basicity of aliphatic and aromatic amines. Quaternary amine salts as phase-transfer catalysts		
	7	Comparative study of aliphatic and aromatic amines.	Assignment No:2	
	8	Preparation of alkyl and arylamines (reduction of nitro compounds, nitriles),		
	9	**FIRST INTERNAL EXAMINATION**		
Text Books	1. I. L. Finar, Organic Chemistry -, 6th Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24). 2. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 22,23). 3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22). 4. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter- 22,23,24). 5. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.			
	10	Reductive amination of aldehydes and ketones Gabriel-Phthalimide reaction, Hoffmann bromamide reaction.	Assignment No.3	**CO1**

	11	Diazonium salts-preparation, synthetic transformations of aryldiazonium salts		**CO1**
	No. of Session	**Session Topic and Discussion Theme**	**Value additions**	**COs**
	12			**CO1**
	13	Azo Coupling - Mechanisms of Sandmeyer's and Gatterman reactions	Group Discussion	**CO1, C03**
		SECOND INTERNAL EXAMINATION		
Text Books	1. I. L. Finar, Organic Chemistry -, 6th Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24). 2. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 22,23). 3. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22). 4. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter- 22,23,24). 5. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.			
Organic compounds containing Nitrogen *(5 hours)*	14	Schiemann and Gomberg reactions		**CO1**
	15	Preparation and uses of Phenyl hydrazine		**CO1, CO5**
	16	Diazomethane - preparation, structure and synthetic uses	Demonstration	**CO1, CO5**
	17	Diazoacetic ester - preparation, structure and synthetic uses	PowerPoint presentation	**CO1, CO5**
	18	Arndt- Eistert synthesis- mechanism	PowerPoint presentation	**CO1, CO5**
	19	Wolff rearrangement –mechanism		

	20	Curtius rearrangement and its mechanism.		
Text Books	6. I. L. Finar, Organic Chemistry -, 6th Edition. Vol.- I, Pearson. (Chapters13, 22, 23, 24). 7. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 22,23). 8. M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22). 9. K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter- 22,23,24). 10. B. S. Bahl, 'Advanced Organic Chemistry', S. Chand.			

Unit II & III , IV & V	No. of Sessions	Session Topic and Discussion Theme	Value additions	COs
Dyes (3 hours)	1	Theory of colour and constitution. Classification - according to structure and method of application.		**CO1**
	2	Preparation and uses of Azo dye-methyl orange and Bismark brown,		**CO1, CO4**
	3	Preparation and uses of Triphenyl methane dye -Malachite green,		**CO1**
	4	Preparation and uses of Phthalein dye - phenolphthalein and fluroescein,		**CO1**
	5	Preparation and uses of Vat dye – indigo,		**CO1, CO4**
	7	Preparation and uses of Anthraquinone dye - alizarin		**CO1, CO4**
	1st Internal Examination			
Text Books	○ I. L. Finar, Organic Chemistry, 6th Edition. Vol - I, Pearson. (Chapter-31) ○ M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) ○ K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-38). ○ B. S. Bahl, 'Advanced Organic Chemistry', S. Chand			
Unit V, VI & VII	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Photochemical Reactions (3 hours), **Organic Polymers (4hours), Soaps and**	10	Introduction- Photochemical versus Thermal reactions. Reactions		**CO1, CO2, C03**
	11	Norrish reactions of acyclic Ketones.	Power Point Presentation	**CO1, CO2, C03**
	12	Patterno-Buchi, Photo-Fries reactions.	Power Point Presentation	**CO1, CO2, C03**
	13	Synthesis and applications of the following polymers- Polyesters- terephthalates,		**CO1**

	14	Nylon 6 and Nylon 6,6, phenol formaldehyde resins, urea formaldehyde resins .	Group Discussion	**CO1**
	2nd Internal Examination			
	15	Epoxy resins and polyurethanes, PVC and Teflon.		**CO1**
	16	Synthetic rubbers –SBR and Nitrile rubber- structure and applications		**CO1**
	17	Composition of soaps- detergent action of soap	Individual Assignment:	**CO1**
	18	Synthetic detergents- - their functions – comparison between soaps and detergents-		**CO1**
	19	Environmental aspects. LAS and ABS detergents		
Text Books	1. I. L. Finar, Organic Chemistry, 6th Edition. Vol- I, Pearson. (p.-323) 2. M. K. Jain and S. C. Sharma, 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) 3. K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-36). 4. R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 31) 5. Billmeyer F.W., Text book of polymer science, Jr.John Wiley and Sons, 1994. 6. Gowariker V.R., Viswanathan N.V. and JayaderSreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.			

VSS

***Unit VIII* & IX**	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Aliphatic hydrocarbons (2 hours), Chemotherapy	1	Cycloalkanes- relative stabilities..		**CO1**
	2	Butadiene – structure and stability, 1,4 addition and its mechanism		**CO1, CO4**
	3	Drugs- introduction –classification –mode of action		**CO1**
	4	Elementary idea of the structure and mode of action of drugs Sulphanilamides,		**CO1**

	5	Elementary idea of the structure and mode of action of drugs Amphicillin and Chloramphenicol		**CO1, CO4**
	7	Elementary idea of the structure and application of Chloroquine, Paracetamol, Analgin and Aspirin.		**CO1, CO4**
	1st Internal Examination			
Text Books	o I. L. Finar, Organic Chemistry, 6th Edition. Vol - I, Pearson. (Chapter-31) o M. K. Jain and S. C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) o K. S. Tewari and N. K. Vishnoi, 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-38). o B. S. Bahl, 'Advanced Organic Chemistry', S. Chand			
Unit IV & V	**No. of Sessions**	**Session Topic and Discussion Theme**	**Value additions**	**COs**
Chemistry of Organic Reagents (4 hours), Structure elucidation (8)	10	Drugs in cancer therapy- Chlorambucil		**CO1, CO2, C03**
	11	Analytical reagents – Tollens reagent, Fehling solution	Power Point Presentation	**CO1, CO2, C03**
	12	Schiff's reagents, Borsche's reagent, Benedict solution-(Procedure not required.	Power Point Presentation	**CO1, CO2, C03**
	13	Applications of Synthetic reagents –NBS, Lead tetra acetate, Periodic acid, OsO_4		**CO1**
	14	Ozone, LDA, Raney Nickel, Selenium dioxide, DCC (elementary idea.	Group Discussion	**CO1**
	2nd Internal Examination			
	15	Introduction to UV, IR and NMR spectroscopy.		**CO1**

	16	UV, IR and NMR spectral characteristics of simple molecules such as ethylene, butadiene, benzene, acetaldehyde, acetone acetophenone, crotonaldehyde, ethanol		**CO1**
	17	Problems pertaining to the structure elucidation of simple organic compounds using IR and PMR spectroscopic techniques	Individual Assignment:	**CO1**
	18	Mass spectrometry- Introduction-EI ionisation- Determination Molecular mass by MS (Elementary idea- fragmentation study not required)		**CO1**
Text Books	I. L. Finar, Organic Chemistry, 6th Edition. Vol- I, Pearson. (p.-323) M. K. Jain and S. C. Sharma, 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co. (Chapter-22) K. S. Tewari and N. K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House (Chapter-36). R. T. Morrison and R.N Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India, (Chapter- 31)			

DEPARTMENT OF CHEMISTRY, SACRED HEART COLLEGE (AUTONOMOUS), THEVARA				
COURSE PLAN : ACADEMIC YEAR 2014 - 2015				
PROGRAMME	**:**	*B.Sc. Chemistry*	**SEMESTER**	**:** *5*
LECTURE HOURS	**:**	*36*	**CREDITS**	**:** *2*
SUBJECT TITLE	**:**	*States of Matter*		
COURSE TEACHERS	**:**	Dr. K. B. Jose (KBJ), Dr. Thommachan Xavier (TX) & Dr. Ignatious Abraham (IGA)		

IGNATIOUS ABRAHAM			
Unit I : GASES			
Sessions	**Session Topic and Discussion Theme**	**Value additions**	
1	Kinetic molecular model of gases		
2	Pressure of an ideal gas, derivation of gas laws		
3	Maxwell's distribution of velocities – molecular velocities (average, root mean square and most probable velocities)		
4	Collision diameter, mean free path		
5	Viscosity of gases – temperature and pressure dependence. Relation between mean free path and coefficient of viscosity.	Power Point Presentation	
6	Barometric distribution law		
7	Law of equipartition of energy		
8	Degrees of freedom and molecular basis of heat capacities.		
9	Real gases: compressibility factor z		
1st Internal Examination			
10	van der Waals equation of state – derivation and application in explaining real gas behaviour.		
11	Virial equation of state	*Assignment* :	

12	Van der Waals equation expressed in virial form – calculation of Boyle temperature	Synthetic Applications of active methylene compounds	
13	Isotherms of real gases		
14	Continuity of states. Critical phenomena.		
15	Liquefaction of gases		
2nd Internal Examination			
Unit III : SYMMETRY			
16	Symmetry of molecules-symmetry elements and symmetry operations – centre of symmetry, plane of symmetry, proper and improper axes of symmetry,	Power Point Presentation	
17	Combination of symmetry elements, molecular point groups, Schoenflies symbol,	*Assignment*	
18	Crystallographic point groups		

References:

1. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical chemistry, Vishal Pub. Co. Jalandhar, Chapters 1,2
2. K. L. Kapoor, A Textbook of Physical chemistry, Volumes 1, Macmillan India Ltd Chaper 1
3. P.Atkins and J Paula, The elements of Physical chemistry, 7th edn., Oxford University Press, Chapter 1
4. F. A. Alberty and R J Silby, Physical Chemistry, 3rd Edn, John Wiley, Chapter 17

THOMMACHAN XAVIER

Unit III : LIQUIDS

Sessions	Session Topic and Discussion Theme	Value additions	
1	Liquid State - introduction		
2	Intermolecular forces in liquids	Power point presentation	
3	Viscosity – Factors affecting viscosity		
4	the viscometer method	Power Point Presentation:	
5	surface tension		
6	Determination of surface tension		
7	Structure of liquids.		
8	Unusual behaviour of water		

Unit III : LIQUID CRYSTALS AND ADSORPTION

9	Classification of liquid crystals	*Assignment*	
1st Internal Examination			
10	Structure of nematic phases		
11	Structure of cholestric phases		
12	Adsorption – types		
13	Adsorption of gases by solids		
14	Factors influencing adsorption		
15	Freundlich adsorption isotherm	Power Point Presentation	
2nd Internal Examination			
16	Langmuir adsorption isotherm		
17	The BET theory		
18	Use of BET equation for the determination of surface area.		

References:

1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 1, Macmillan India Ltd Chapers 2,3
2. P. Atkins and J. Paula, The elements of Physical chemistry, 7th edn., Oxford University Press, Chapter 23
3. A. McQuarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd, Chapter 29
4. B. R. Puri, L. R. Sharma, M. S. Pathania, Elements of Physical Chemistry, Vishal Publishing Co, Chapter 5

K B JOSE

Unit III : SOLID STATE

Sessions	Session Topic and Discussion Theme	Value additions	
1	The nature of the solid state	Power Point Presentation	
2	Anisotropy- the law of constancy of interfacial angles		
3	Law of rational indices - Miller indices.		
4	Seven crystal systems and fourteen Bravais lattices.	*Assignment*	
5	X-ray diffraction, Bragg's law		
6	Detailed study of simple, face centred and body centred cubic systems	Models	
7	Bragg's x-ray diffractometer method	Power Point	

8	Powder pattern method.		
9	Analysis of powder diffraction patterns of NaCl and KCl	Assignment	
1st Internal Examination			
10	Density of cubic crystals, identification of cubic crystal from crystallographic data.	*Assignment*	
11	Close packing of spheres, ccp and hcp arrangements.		
12	Structure of ionic compounds of the type AX - NaCl	Power Point	
13	Structure of ionic compounds of the type AX - CsCl, ZnS	Power Point	
14	Structure of ionic compounds of the type AX2- (CaF_2, Na_2O)	Power Point	
15	Defects in crystals – stoichiometric and non-stoichiometric defects	*Assignment*	
2nd Internal Examination			
16	Extrinsic and intrinsic defects.		
17	Electrical conductivity, semiconductors, n-type, p-type		
18	Superconductivity – an introduction	Power Point	

References:

1. Peter Sykes, A Guide book to Mechanism in Organic Chemistry: 6th Edition, Pearson Education.
2. P. S. Kalsi' 'Organic Reactions and their Mechanisms'' New Age International Publishers.
3. K.S. Tewari and N.K. Vishnoi 'Organic Chemistry', 3rd Edition, Vikas Publishing House.
4. M. K. Jain and S.C. Sharma 'Modern Organic Chemistry', 3rd Edition, Vishal Publishing Company Co.
5. R. T. Morrison and R. N. Boyd, 'Organic Chemistry', 6th Edition - Prentice Hall of India,
6. I. L. Finar, Organic Chemistry, 6th Edition. Vol.- I, Pearson

COURSE PLAN					
ACADEMIC YEAR 2014 - 15					
PROGRAMME	**:**	*B.Sc. Chemistry*	**LECTURE HOURS**	**:**	*36*
SEMESTER	**:**	*5*	**CREDITS**	**:**	*2*
SUBJECT TITLE	**:**	Quantum Mechanics and Spectroscopy			
COURSE TEACHERS	**:**	*Dr.Jinu George, Dr.Jorphin Joseph, Mr. Senju Devassykutty*			
Objectives	**:**	• To differentiate between classical and quantum mechanics • To study the postulates of quantum mechanics and the quantum mechanical model of the hydrogen atom • To study valence bond and molecular orbital theory • To study the principle and applications of microwave, infra red, Raman, electronic and magnetic resonance spectroscopy. • To study the fundamentals of mass spectrometry To study the fundamentals of photochemistry			
Instructional Hours	**:**	*3 hours/week*			

	No. of Sessions	Session Topic and Discussion Theme	Value additions	Courses/ Text book/Web URL
Unit .2. Molecular spectroscopy I	1	**1. Introduction to spectroscopy** Introduction: electromagnetic radiation, regions of the spectrum,		Presentation on: Molecules and Molecular Spectroscopy - UAF 12/17/2017
	2	interaction of electromagnetic radiation with molecules, various types of molecular spectroscopic techniques,		
	3	Born-Oppenheimer approximation.		
	4	**2. Rotational spectroscopy** Introduction to Rotational spectrum:	ICT	
	5	diatomic molecules, energy levels of a rigid rotator, selection rules, determination of bond length.		
	7	**3. Vibrational spectroscopy**		
	1st Internal Examination			
	8	Vibrational spectrum: the simple harmonic oscillator		
	9	– energy levels, force constant, selection rules.		
Text Books	**References** 1. R. Puri, L. R. Sharma, M. S. Pathania, '*Elements of Physical Chemistry*', Vishal Pub. Co., 2. K. J. Laidler, John H. Meiser, '*Physical Chemistry'*, 2nd edn..			
	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
	10	Anharmonic oscillator		
	11	– pure vibrational spectra of diatomic molecules,	Power Point Presentation	

	12	selection rules, fundamental frequencies, overtones,	Power Point Presentation	
	13	hot bands. Degrees of freedom for polyatomic molecules,		
	14	revision	Group Discussion	
	2nd Internal Examination			
	15	concept of group frequencies –		Classical Mechanics with a Bang! - URL is "https://modphys.hosted.uark.edu/markup/CMwBang_UnitsDetail_2017.html"
	16	– pure vibrational spectra of diatomic molecules,		
	17	frequencies of common functional groups in organic compounds.		
	18	Revision		
Text Books	**References** • K. K. Sharma, L R Sharma, '*A Text Book of Physical Chemistry'*, Vikas Publishing house. • S. Negi, S. C. Anand, '*A Textbook of Physical Chemistry*', Second Edition, New Age International (P) limited, publishers.			

	No. of Sessions	Session Topic and Discussion Theme	Value additions	
Unit 1. Quantum mechanics	1	Classical mechanics: concepts, failure of classical mechanics,	Assignment No. 1	Modern Physics and its Classical Foundations - URL is "https://modphys.hosted.uark.edu/markup/MPCFWeb.html" Principles of Symmetry, Dynamics, and Spectroscopy *{Text}* - URL is "https://modphys.hosted.uark.edu/markup/PSDSWeb.html" Quantum Theory for the Computer Age - URL is "https://modphys.hosted.uark.edu/markup/QTCA_UnitsDetail.html"
	2	Qualitative idea about the energy distribution in black body radiation. Plank's radiation law, Compton effect.		
	3	Binding energy of an electron in hydrogen atom, radius of the hydrogen atom, de Broglie hypothesis, dual nature of electrons –		
	4	Davisson and Germer's experiment. Heisensberg's uncertainty principle and its significance.		
	5	Sinusoidal wave equation (no derivation needed).		
	7	Wave function – physical interpretation, concept of operators, eigen functions, eigen values.		
	1st Internal Examination			
	8	Postulates of quantum mechanics, Particle in one-dimensional box –		
	9	Derivation for energy, application to linear conjugated polyene (butadiene).		
Text Books	**References** 1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 4, Macmillan India Ltd Chaper 1,2 2. Mc Quarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd, Chapters 1,2,3,4,6 3. I. N. Levine, Physical Chemistry, Tata Mc Graw Hill, Chapter18 4. A. Bahl, B. S. Bahl, G. D. Tuli, Essentials of Physical Chemistry, S. Chand and Company, chapter 1,2 5. K. J. Laidler, John H.Meiser, Physical Chemistry,2nd edn, Chapters 11,12			
	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
	10	Introductory treatment of Schrödinger equation for hydrogen atom.		
	11	Quantum numbers and their importance, hydrogen like wave functions –	Power Point Presentation	
	12	Radial and angular wave functions, radial distribution curves.	Power Point Presentation	

	13	Molecular orbital theory: basic ideas – criteria for forming MO from AOs,		
	14	Construction of molecular orbital by LCAO method,	Group Discussion	
	2nd Internal Examination			
	15	H2+ ion (elementary idea only), physical picture of bonding and anti bonding wave functions,		
	16	Concept of antibonding orbitals and their characteristics		
	17	Introduction to valence bond model of hydrogen molecule,		
	18	comparison of MO and VB methods.		
Text Books	**References** 1. K. L. Kapoor, A Textbook of Physical chemistry, Volume 4, Macmillan India Ltd Chaper 1,2 2. Mc Quarrie, J. D. Simon, Physical Chemistry – A molecular Approach, Viva Books Pvt. Ltd, Chapters 1,2,3,4,6 3. I. N. Levine, Physical Chemistry, Tata Mc Graw Hill, Chapter18 4. A. Bahl, B. S. Bahl, G. D. Tuli, Essentials of Physical Chemistry, S. Chand and Company, chapter 1,2 5. K. J. Laidler, John H.Meiser, Physical Chemistry,2nd edn, Chapters 11,12			

	No. of Sessions	Session Topic and Discussion Theme	Value additions	
Unit .3. Molecular spectroscopy II	1	➢ ***Electronic Spectroscopy:*** Introduction		
	2	Electronic spectrum: concept of potential energy curves for bonding and anti-bonding molecular orbitals		
	3	➢ electronic transition, the Frank-Condon principle,		
	4	dissociation energy. Polyatomic molecules – qualitative description of σ, π and n- molecular orbitals		
	5	➢ Polyatomic molecules- energy levels and the respective transitions	ICT	
	7	***NMR Spectroscopy*** **:** NMR spectroscopy: basic principles of NMR spectroscopy		
	1st Internal Examination			
	8	Nuclear spin, Larmor precession. Proton magnetic resonance (^{1}H NMR or PMR)		
	9	Nuclear shielding and deshielding, chemical shift and molecular structure. Spin-spin splitting and coupling constant.		
Text Books	**References** 1. R. Puri, L. R. Sharma, M. S. Pathania, '*Elements of Physical Chemistry*', Vishal Pub. Co., 2. K. J. Laidler, John H. Meiser, '*Physical Chemistry'*, 2nd edn..			
	No. of Sessions	**Session Topic and Discussion Theme**	**Value additions**	
Unit 4. Photochemistry	10	➢ First order spectra – interpretation of PMR spectra of simple organic molecules		
	11	➢ First order spectra examples- ethyl bromide, ethanol, acetaldehyde, ethyl acetate, toluene, acetophenone.	Power Point Presentation	
	12	➢ ***Mass Spectroscopy*****:** Mass spectrometry: Basic principle-ionization	Power Point Presentation	

	13	➢ Fragmentation, separation of ions and representation of the spectrum		
	14	Application in molecular mass determination.		
	2nd Internal Examination			
	15	➢ ***Photochemistry:*** Interaction of radiation with matter: Laws of photochemistry – Grothus-Draper law, Stark-Einstein law, examples of photochemical reactions.		
	16	Beer law and Beer-Lambert's law. Jablonsky diagram, qualitative description of fluorescence		
	17	Quantum yield, primary and secondary processes. Basic concepts of photosensitized reactions – photosynthesis, dissociation of hydrogen molecule, isomerization of 2-butene, and chemiluminescence.		
	18	Optical properties - optical activity, molar refraction.		
Text Books	**References** • K. K. Sharma, L R Sharma, '*A Text Book of Physical Chemistry'*, Vikas Publishing house. • S. Negi, S. C. Anand, '*A Textbook of Physical Chemistry*', Second Edition, New Age International (P) limited, publishers.			

SACRED HEART COLLEGE(AUTONOMOUS), THEVARA

DEPARTMENT OF CHEMISTRY

COURSE PLAN
ACADEMIC YEAR 2014-2015

PROGRAMME	Open course	**SEMESTER**	5
COURSE TITLE	Chemistry in Everyday life	**CREDIT**	3
HOURS/SEM	72		

COURSE OBJECTIVES

FACULTY NAME	Dr. Joseph T Moolayil (JTM), Dr. Grace Thomas (GT), Dr. Ramakrishnan S (RKS), Dr. Abi T G (ATG)

1	Understand chemistry of Food additives and Flavours
2	Understand chemistry of Soaps
3	Understand chemistry of synthetic detergent
4	Understand chemistry of Cosmetics
5	Understand chemistry of Plastics, Paper Dyes
6	Understand chemistry of Drugs
7	Understand chemistry of Chemistry and Agriculture

Dr. Abi T. G.				
Plastics, Paper Dyes				**(14 Hrs)**
Sl.No	**Session**	**Topic**	**Method of Teaching**	**Remarks**
1	1	Plastics in everyday life	Chalk & Board	
2	2	Brief idea of polymerization-	Chalk & Board	
3	3	Thermoplastic and thermosetting polymers.	Chalk & Board	
4	4	Use of PET, HDPE, PVC, LDPE, PP, ABS.	Chalk & Board	
5	5	Use of PET, HDPE, PVC, LDPE, PP, ABS.	Chalk & Board	
First Internal Examination				
6	6	Biodegradable plastics	Chalk & Board	
7	7	Environmental hazards of plastics	Chalk & Board	
8	8	News print paper, writing paper, paper boards, cardboards.	Chalk & Board	
9	9	Organic materials, wood, cotton, jute and coir.	Chalk & Board	
10	10	International recycling codes, and symbols for identification.	Chalk & Board	
11	11	Natural and synthetic dyes (basic idea only).	Chalk & Board	
12	12	Recycling of plastics.	Chalk & Board	

Second internal Examination				
13	13	Revision	Chalk & Board	
14	14	Revision	Chalk & Board	
Synthetic Detergents				**(3 Hrs)**
15	15	Enzymes used in commercial detergents	Chalk & Board	
16	16	Environmental hazards.	Chalk & Board	
17	17	Revision	Chalk & Board	

Dr. Joseph T Moolayil				
Cosmetics		**(12 Hrs)**		
1	1	Cosmetics- Introduction,	Chalk & Board	
2	2	classification	Chalk & Board	
3	3	bathing oils	Chalk & Board	
4	4	toilet powder,	Chalk & Board	
5	5	dental cosmetics	Chalk & Board	
6	6	shaving cream	Chalk & Board	
First Internal Examination				
7	7	shampoo, hair dyes	Chalk & Board	
8	8	face creams	Chalk & Board	

9	9	skin products	Chalk & Board	
10	10	General formulation of each type.	Chalk & Board	
11	11	Toxicology of cosmetics	Chalk & Board	
12	12	revision	Chalk & Board	
Soaps			**(7 Hrs)**	
13	13	Soaps – Introduction	Chalk & Board	
		Second Internal Examination		
14	14	Detergent action of soap.	Chalk & Board	
15	15	Toilet soap, bathing bars	Chalk & Board	
16	16	Washing soaps, liquid soap manufacture-. Significance of acidity and alkalinity.	Chalk & Board	
17	17	Additives, fillers and flavours	Chalk & Board	
18	18	Significance of acidity and alkalinity	Chalk & Board	
19	19	Revision	Chalk & Board	

Dr. Ramakrishnan S				
Food additives and Flavours				**(12 Hrs)**
1	1	Functional food additives	Chalk & Board	
2	2	adulteration	Chalk & Board	
3	3	food laws	Chalk & Board	

4	4	food laws	Chalk & Board	
5	5	Food colours - permitted and non – permitted-	Chalk & Board	
6	6	Food colours: Toxicology.	Chalk & Board	
First Internal Examination				
7	7	Flavours – natural and synthetic-	Chalk & Board	
8	8	Flavours – Toxicology	Chalk & Board	
9	9	Other functional additives	Chalk & Board	
10	10	Soft drinks- formulation	Chalk & Board	
11	11	Health drinks	Chalk & Board	
12	12	Revision	Chalk & Board	
Synthetic Detergents				**(6 Hrs)**
13	13	Detergents- Introduction,	Chalk & Board	
Second Internal Examination				
14	14	detergent action	Chalk & Board	
15	15	types of detergents-cationic, anionic, amphiphilic detergents.	Chalk & Board	
16	16	Common detergent chemicals.	Chalk & Board	
17	17	Additives, excipients colours and flavours.	Chalk & Board	
18	18	Revision	Chalk & Board	

Dr. Grace Thomas				
Drugs				**(6 Hrs)**
1	1	Chemotherapy	Chalk & Board	
2	2	- types of drugs- analgesics,	Chalk & Board	
3	3	- types of drugs- antipyretics, antihistamines	Chalk & Board	
4	4	- types of drugs- antacids tranquilizers, sedatives	Chalk & Board	
5	5	- types of drugs: antibiotics	Chalk & Board	
6	6	- types of drugs- antifertility drugs.	Chalk & Board	
First Internal Examination				
Chemistry and Agriculture				**(12 Hrs)**
7	7	Fertilizers- natural, synthetic, mixed	Chalk & Board	
8	8	NPK fertilizers.	Chalk & Board	
9	9	Excessive use of fertilizers and its impact on the environment.	Chalk & Board	
10	10	Bio fertilizers. Plant growth hormones.	Chalk & Board	
11	11	Pesticides- Classification-insecticides, herbicides, fungicides.	Chalk & Board	

12	12	Excessive use of pesticides – environmental hazards.	Chalk & Board	
13	13	Excessive use of pesticides – environmental hazards.	Chalk & Board	
Second Internal Examination				
14	14	Bio pesticides.	Chalk & Board	
15	15	Antiseptics and Disinfectants	Chalk & Board	
16	16	Disinfectants-Oils - vegetable oils, mineral oil	Chalk & Board	
17	17	essential oil-Sugars, artificial sugars	Chalk & Board	
18	18	Revision	Chalk & Board	

ASSIGNMENTS AND SEMINARS

Sl No	**Module**	**Topic**	**Nature of Assignment**	**Remarks**
1	1	Excessive use of pesticides – environmental hazards.	Case studies in short	
2	2	Ingredients of any 2 cosmetics	written	

Reference books	
1	P. Coultate, Food- The Chemistry of its components. Royal Society of Chemistry, London(Paper back)
2	Shashi Chowls,Engineering Chemistry, Danpat Rai Publication.
3	B.K. Sharma. Industrial Chemistry
4	CNR Rao- Understanding chemistry, Universities Press.
5	Puri and Sharma. Advanced Organic Chemistry.
6	Brown, Insect control by chemicals
7	A. K. De, Environmental Chemistry, New age International Ltd.
8	S. S. Dara, A Textbook of Environmental chemistry and pollution control, S.Chand & Company Ltd
9	Tisdale, S.L., Nelson, W.L. and Beaton, J. D. Soil Fertility and Fertilizers, Macmillian Publishing Company, New York, 1990.
10	Buchel, K.H. Chemistry of Pesticides, John Wiley & Sons, New York, 1983
11	P.C Pall, K. Goel, R.K Gupta, Insecticides,pesticides and agrobased industries.
12	Gowariker V.R., Viswanathan N.V. and Jayader Sreedhar, Polymer Science, Wiley Eastern Ltd., New Delhi.
13	I.I Singh, V.K Kapoor, Organic Pharmaceutical Chemistry